

Sub A17

20 from the housing side

21 a ring gear formed in the housing interior surface opposite the planet gears, said  
22 ring gear being in meshing engagement with the planet gears so that when an electric cur-  
23 rent is applied to the stator winding, the rotor rotates relative to the first and third shafts at  
24 a selected speed and the hub rotates relative to the first and third shafts at a lesser speed.

1 2. The assembly defined in claim 1 and further including means for sealing the inte-  
2 rior of the housing from the interior of the hub.

1 3. The assembly defined in claim 2 and further including means for introducing a  
2 thermally conductive liquid into the hub so that when the hub rotates relative to the first  
3 and third shafts, said liquid is circulated through said gap so that heat generated within  
4 the housing is conducted by the liquid to the hub walls and thence to the outside.

1 4. The assembly defined in claim 1 wherein said third shaft projects through the hub  
2 second end wall.

1 5. The assembly defined in claim 1 wherein the hub second end wall covers the third  
2 shaft so that the assembly can be cantilever-mounted via the first shaft.

1 6. The assembly defined in claim 1 wherein the rotor, housing side wall and hub side  
2 wall are cylindrical.



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1 7. The assembly defined in claim 1 wherein the stator winding is a toroidal, 3 wire, 3  
2 phase WYE-connected winding.

1 8. The assembly defined in claim 7 wherein the rotor has a plurality of poles.

1 9. The assembly defined in claim 1 wherein  
2 the planet gears are rotatably mounted to axles projecting from the housing  
3 second end wall, and  
4 the means for connecting include a retainer plate releasably mounted to  
5 said axles, said third shaft extending axially from the retainer plate.

1 10. The assembly defined in claim 9 wherein the third shaft projects through the hub  
2 second end wall.

1 11. The assembly defined in claim 9 wherein the hub second end wall covers the third  
2 shaft so that the assembly can be cantilever-mounted via the first shaft.

1 12. The assembly defined in claim 1 and further including  
2 a sprocket, and  
3 a one-way clutch connected between the sprocket and the hub second end  
4 wall so that the sprocket can rotate about said axis in only one direction relative to the  
5 hub.

13

1 ~~13~~ The assembly defined in claim 1 and further including  
2 a tire rim surrounding the hub side wall;  
3 a plurality of spokes having corresponding first and second ends;  
4 means for connecting the first ends of the spokes to the hub, and  
5 means for connecting the second ends of the spokes to the rim so that the  
6 rim is centered on said axis.

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1 ~~14~~ The assembly defined in claim 1 and further including  
2 a tire rim surrounding the hub side wall, and  
3 means for connecting the tire rim to the hub side wall.

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1 ~~15~~ The assembly defined in claim 15 wherein the means for connecting are releasable  
2 so that the rim can be separated from the hub.

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1 ~~16~~ The assembly defined in claim 15 and further including a brake <sup>member</sup> ~~disc~~ releasably  
2 mounted to one of said hub end walls so as to be centered on said axis.

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1 ~~17~~ The assembly defined in claim 1 and further including a tire engaged around the  
2 hub side wall.

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18  
1 ~~18~~ The assembly defined in claim 1 wherein said ring gear is formed in the hub side  
2 wall.

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1 ~~19~~ The assembly defined in claim 1 wherein  
2 the hub second end wall has a cylindrical skirt which forms an extension  
3 of the hub side wall, and  
4 said ring gear is formed in said skirt.

20  
1 ~~20~~ The assembly defined in claim ~~20~~ <sup>19</sup> wherein  
2 the hub second end wall is a separate part from the hub side wall, and  
3 means for releasably securing the hub second end wall to the hub side  
4 wall.

21  
1 ~~21~~ The assembly defined in claim ~~21~~ <sup>20</sup> wherein each planet gear has a relatively large  
2 diameter first section in meshing engagement with the pinion and a smaller diameter sec-  
3 ond section collinear to the first section and in meshing engagement with the ring gear so  
4 that the assembly has two-stage gear reduction.

22  
1 ~~22~~ The assembly defined in claim 1 wherein each planet gear has a relatively large  
2 diameter first section in meshing engagement with the pinion and a smaller diameter sec-  
3 ond section collinear to the first section and in meshing engagement with the ring gear so  
4 that the assembly has two-stage gear reduction.

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- 1 ~~23~~ The assembly defined in claim 1 wherein the hub is less than 5 inches in diameter  
2 and the assembly has a gear reduction ratio exceeding 10:1.

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- 1 ~~24~~ The assembly defined in claim 1 wherein the housing second end wall is separable  
2 from the housing side wall and the hub first end wall is separable from the hub side wall.

25

- 1 ~~25~~ The assembly defined in claim 1 and further including  
2 an electrical connector mounted to the first shaft;  
3 electrical leads extending from the connector along the first shaft to the  
4 interior of the housing, and  
5 means for connecting the leads to the stator winding.

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- 1 ~~26~~ The assembly defined in claim 1 and further including  
2 first means acting between the rotor and the housing first end wall for bias-  
3 ing the rotor toward the third shaft, and  
4 second means acting between the means for connecting and the hub sec-  
5 ond end wall for biasing the housing toward the first shaft.

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- 1 ~~27~~ A motorized wheel hub assembly comprising

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Rule 126

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2 a sealed motor section having first and second end walls and a side wall  
3 extending between the end walls, a first shaft extending from the first end wall and a ro-  
4 tary second shaft extending from the second end wall coaxial to the first shaft, and  
5 a gear reduction section adjacent to the second end wall, said gear reduc-  
6 tion section including a pinion at the end of the rotary shaft, a plurality of planet gears  
7 rotatably mounted to the second end wall in meshing engagement with the pinion, a third  
8 shaft connected to the second end wall, said third shaft being separate from but coaxial to  
9 the first and second shafts, a hub having an interior surface closely surrounding the motor  
10 section and planet gears and being rotatably coupled to the first and third shafts, and a  
11 ring gear formed at the interior surface of the hub in meshing engagement with the planet  
12 gears so that when the second shaft rotates at a selected speed, the hub rotates relative to  
13 the first and third shafts at a lesser speed.

1 <sup>25</sup>~~28~~ The assembly defined in claim <sup>27</sup>~~28~~ and further including means for introducing a  
2 thermally conductive liquid into the hub so that when the hub rotates, the liquid is circu-  
3 lated within the hub so that heat generated within the motor section is conducted by the  
4 liquid to the hub and thence to the outside.

1 <sup>29</sup>~~28~~ The assembly defined in claim <sup>27</sup>~~28~~ wherein the first and third shafts project from  
2 the hub.

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1 The assembly defined in claim 28 wherein only the first shaft projects from the  
2 hub.

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1 The assembly defined in claim 28 wherein  
2 the hub has first and second end walls and a side wall extending between  
3 said end walls, and

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1 The assembly defined in claim 32 wherein said ring gear is formed in the hub side  
2 wall.

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1 The assembly defined in claim 32 wherein  
2 the hub second end wall has a cylindrical skirt which forms an extension  
3 of the hub side wall, and  
4 said ring gear is formed in said skirt.

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1 The assembly defined in claim 32 wherein  
2 the hub second end wall is a separate part from the hub side wall, and  
3 means for releasably securing the hub second end wall to the hub side  
4 wall.

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1 The assembly defined in claim 35 wherein each planet gear has a relatively large  
2 diameter first section in meshing engagement with the pinion and a smaller diameter sec-



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1 The assembly defined in claim 28 wherein each planet gear has a relatively large  
2 diameter first section in meshing engagement with the pinion and a smaller diameter sec-  
3 ond section collinear to the first section and in meshing engagement with the ring gear so  
4 that the assembly has two-stage gear reduction.